



## Background of the Invention

### 1. Field of the Invention

This invention relates to a device for connecting a catheter to tubing for draining excess cerebrospinal fluid from the brain.

### 2. Description of Related Art

It is common medical practice to drain excess cerebrospinal fluid from the brain in cases of hydrocephelus or trauma to the brain. This is commonly done by inserting a catheter into the ventricles of the brain by a process called a ventriculostomy. The catheter is typically made of silicone. An example of such a catheter is the model 46118 EDM Ventricular Catheter sold by Medtronic-PS Medical of Goleta, California. Excess cerebrospinal fluid is drained through the catheter into a flexible drip assembly line where it is collected and measured in a drip assembly system.

The catheter is connected to the drip assembly line outside the skull of the patient away from the opening placed in the skull for the catheter to pass. An example of such a drip assembly is the model 46128 Becker EDMS Assembly External Drainage and Monitoring System sold by Medtronic-PS Medical of Goleta, California.

As shown in Figure 1, to fix the catheter 2 to the patient's skull, the catheter 2 is typically connected to the drip assembly line 4 of the drip assembly 6 through a luer connector 8 that extends a distance into an inner lumen 10 of catheter 2. The luer connector 8 has an axis 12 that is aligned with the axis 14 of the catheter 2. A silicone "collar" 16 is wrapped around the silicone catheter 2. A portion of the luer connector 8 extends into the catheter 2. Collar 16 is sutured to the patient's scalp 18. The stickiness

of the two silicone pieces, catheter 2 and collar 16, keeps the catheter 2 from moving relative to the collar 16.

The axis 12 of luer connector 8 may run parallel to the patient's scalp 18 making it difficult to connect the drip assembly line 4 to the luer connector 8. This problem occurs because there is no clearance between the luer connector 8 and the patient's scalp 18. In addition, because there are separate elements for luer connector 8 and collar 16, additional time is required to separately configure the luer connector 8 and collar 16. Further, these types of prior art connectors rely on the inherent stickiness of the silicone to silicone contact to maintain the relative positions of the catheter 2 and the collar 16. It is possible that this inherent stickiness may be compromised in an operating room environment. These are problems in want of a solution.

### Summary of the Invention

A luer connector is described that is angled away from the patient's scalp in the direction of the drip assembly line. In the preferred embodiment, the luer connector has a female luer connector that mates with a male luer connector on the drip assembly line. The luer connector also has a hollow protrusion that extends into a catheter thereby allowing the luer connector to be fluidly connected to the catheter. A fluid passage is formed through the angled luer connector from the female luer connector, through the body of the angled luer connector and through the hollow protrusion. The luer connector has a pair of "wings" that extend outwardly from the luer connector and allow the luer connector to be sutured to the patient's scalp.

It is a primary object of the present invention to provide a luer connector for connecting a catheter to a drip assembly line that allows the medical practitioner to easily and reliably connect the drip assembly line to the catheter connector.

It is another object of the present invention to provide a luer connector for connecting a catheter to a drip assembly line that consolidates the features of a luer connector and a collar into a single unit.

These and other object of the present invention will be clear with reference to the description contained herein and more particularly with reference to the following detailed description of the invention and the accompanying drawings. Throughout the description, like elements are referred to by like reference numbers.

### **Brief Description of the Drawings**

Figure 1 is a top view of a prior art collar and luer connector with the collar in an open position.

Figure 2 is a top view of the prior art collar and luer connector of Figure 2 with the collar of Figure 1 in a closed position around the catheter.

Figure 3 is a perspective view of the prior art collar and luer connector of Figure 2.

Figure 4 is a perspective view of the angled luer connector of the present invention.

Figure 5 is a side view of the angled luer connector of Figure 4.

Figure 6 is a cross-sectional side view of the luer connector of Figure 4.

Figure 7 is an end view of the angled luer connector of Figure 4.

Figure 8 is an end view of the angled luer connector of Figure 4.

Figure 9 is a bottom view of the angled luer connector of Figure 4.

### **Detailed Description of the Invention**

The angled luer connector is shown in the Figures generally labeled 20. Angled luer connector 20 includes a central hollow barrel 22 having a barrel lumen 24. Barrel 22 has a barrel axis 26 that is coaxial with barrel lumen 24.

A hollow catheter connection protrusion 28 is attached to and extends away from barrel 22. Catheter connection protrusion 28 has a protrusion lumen 30 that extends through catheter connection protrusion 28. In the preferred embodiment, protrusion lumen 30 is coaxial with barrel lumen 24. Catheter connection protrusion 28 has an outside diameter that allows it to be firmly inserted into the inner lumen 10 of catheter 2. To more firmly seat catheter connection protrusion 28 within the inner lumen 10 of catheter 2, a bulbous end 32 is formed on the end of catheter connection protrusion 28. Bulbous end 32, at its greatest diameter, has a slightly larger diameter than the majority of catheter connection protrusion 28.

Angled luer connector 20 has a pair of substantially planar, wing-like anchoring protrusions 34a,b that extend away from barrel 22. Together, anchoring protrusions 34a,b form a substantially planar platform 36 to contact the patient's scalp 18. This prevents the angled luer connector 20 from rotating about the axis 26 and firmly locates the angled luer connector 20 on the patient's scalp 18. Each anchoring protrusion 34 has a suture

hole 38 that allows the anchoring protrusions 34a,b, and consequently the angled luer connector 20, to be firmly anchored to the patient's scalp 18.

A female luer connector 40 is attached to barrel 22 opposite protrusion 28. Female luer connector 40 has a female luer axis 42 that is not coaxial with axis 26. In the preferred embodiment, axis 42 intersects axis 26 at an angle of about 30°. The 30° angle between axis 42 and axis 26 is oriented so that axis 42 also forms about a 30° angle to the substantially planar platform 36. In this way, when angled luer connector 20 is sutured to a patient's scalp 18 as described below, female luer connector 40 is directed away from the patient's scalp 18.

In the preferred embodiment, female luer axis 42 is equidistant from each of the anchoring protrusions 34a,b. However, in an alternate embodiment, female luer axis 42 may be rotated around its intersection with barrel axis 26 so that it is closer to one of the anchoring projections 34a,b than the other.

Although the preferred angle between central axis 42 and axis 26 is about 30°, any angle between central axis 42 and axis 26 that allows female luer connector 40 to be directed away from the patient's scalp 18 is within the invention. In particular, it is anticipated that an angle as low as 15° or as high as 90° between central axis 42 and axis 26 is within the scope of the invention.

Female luer connector 40 is threaded and allows a male luer connector of corresponding threads to be mated with female luer connector 40 as is well understood in the art. Female luer connector 40 is in fluid communication with barrel lumen 24 so that fluid entering the female luer connector 40 through the interconnection between female

luer connector 40 and a male luer connector passes into barrel lumen 24. Because female luer connector 40 is angled away from the patient's scalp as described above, the physician will be able to more easily connect the male luer connector to the female luer connector 40.

Although the preferred embodiment has a female luer connector 40 connected to barrel 22, it is also within the scope of the invention for other connectors to be attached to barrel 22 for connecting angled luer connector 20 to a drip assembly line 4. This would include replacing female luer connector 40 with a male luer connector. Of course, a female luer connector would then need to be placed on the drip assembly line 4. Other connectors and connecting systems will occur to those skilled in the art.

Preferably, angled luer connector 20 is made of a rigid thermo-plastic such as polycarbonate, polypropylene, polyoxymethylene, PET, nylon, styrene or acrylic. Alternately, angled luer connector 20 can be made of metal, ceramic or almost any other semi-rigid thermo-plastic or thermoset material.

In use, a physician will insert catheter 2 into the patient's ventricle by performing a ventriculostomy. The proximal end of catheter 2 will extend outside of the patient's skull. The physician will insert catheter connection protrusion 28 into the inner lumen 10 of catheter 2. Bulbous end 32 assists in retaining catheter connection protrusion 28 in the inner lumen 10 of catheter 2. The physician will typically place a suture around catheter 2 and protrusion 28 to more securely hold catheter 2 in position on catheter connection protrusion 28.

Anchoring protrusions 34a,b are sutured to the patient's scalp 18 through suture holes 38. The male luer connector from the drip assembly line 4 is connected to female luer connector 40. Excess cerebrospinal fluid then passes from the ventricle, through the inner lumen 10 of catheter 2 to angled luer connector 20 where it passes to drip assembly line 4 to ultimately be collected and measured in drip assembly 6.

The invention has been described in connection with a specific embodiment. It will be clear to those skilled in the art that changes and modifications may be made to the description given herein and still fall within the scope of the invention as claimed in the following claims. Further, obvious modifications and changes to the description will occur to those skilled in the art that will still fall within the claims.

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